

REMARKS

Claims 1 and 3-33 are pending. Claim 2 was previously canceled. Independent claims 1, 7, 18, 23, 24 and 28 have been amended. Applicants respectfully request reconsideration of the application.

Allowable Subject Matter

Claims 4, 9-15, 19-20, 26-27, and 29 have been objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants gratefully acknowledge the indication of the allowable subject matter. Based on the remarks below, Applicants have chosen not to rewrite claims 4, 9-15, 19-20, 26-27, and 29 in independent form at this time

Claim Rejection under 35 U.S.C. §102

Claims 7, 16 and 17 have been rejected under 35 U.S.C. §102(a) as allegedly being anticipated by "Octree Approximation and Compression Methods," *Proceedings of First International Symposium on 3D Data Processing Visualization and Transmission*, IEEE Computer Society, pp. 1-10 (June 2002) to Samet *et al.* ("Samet"). Applicants respectfully traverse the rejection for at least the following reasons.

As amended, independent claim 7 recites, among other features, "(a) generating three-dimensional object data having a tree structure of a predetermined depth in which nodes include attached labels indicating their respective types, the types comprising nodes having sub-nodes, nodes having all voxels located in the

background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background, wherein the nodes at the predetermined depth having voxels located where objects exist and in the background do not have sub-nodes."

As shown in Table 1 of the specification of the instant application, in one embodiment, volume data is represented by an octree having four types of nodes: (1) nodes labeled "B" include only black voxels, (2) nodes labeled "W" include only white voxels, (3) nodes labeled "S" have sub-nodes, and (4) nodes labeled "P" are located at the predetermined depth of the octree and include black voxels as well as white voxels. (Specification at page 10, lines 19-29). Because they are located at the predetermined depth of the octree, "P" nodes are different from "S" nodes in that "P" nodes do not have sub-nodes. For example, as shown in the exemplary octree structures of FIGS. 3B-3D, "S" nodes are not located at the predetermined depth of the octree and are subdivided into sub-nodes, while "P" nodes are located at the predetermined depth of the octree and are not subdivided into sub-nodes, and "P" nodes include black as well as white voxels, which can be encoded using a prediction-by-partial-matching (PPM) method. (Specification at page 10, lines 27-29).

Samet describes an octree representation consisting of three types of nodes: WHITE, BLACK and GRAY. (Samet at page 2, section 2 "Octree Representation"). Samet teaches that blocks corresponding to non-leaf nodes are labeled "GRAY." (Samet at page 2, section 2 "Octree Representation"). Samet also teaches that leaf nodes correspond to those blocks of the array for which no further subdivision is necessary. (Samet at page 2, section 2 "Octree Representation"). Thus, as non-leaf

nodes, GRAY nodes correspond to those blocks of the array for which further subdivision is necessary. For example, as shown in FIG. 2 of Samet, internal/non-leaf nodes (i.e., GRAY nodes, which are depicted as white squares) are not located at the depth of the octree and are subdivided into sub-nodes. Nowhere does Samet describe a node located at the depth of the octree that includes black as well as white voxels and that is not subdivided into sub-nodes.

Thus, because the internal/non-leaf nodes labeled GRAY in Samet do not describe "nodes at the predetermined depth having voxels located where objects exist and in the background, wherein the nodes at the predetermined depth having voxels located where objects exist and in the background do not have sub-nodes," as recited in claim 7, Applicants submit that Samet does not anticipate claim 7. Accordingly, for at least these reasons, Applicants respectfully request that the §102(a) rejection of claim 7, and of claims 16 and 17, which depend therefrom, be withdrawn.

Claim Rejections under 35 U.S.C. §103

Claims 1, 6, 24, 28, 30 and 33

Claims 1, 6, 24, 28, 30 and 33 have been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent No. 5,123,084 to Prevost *et al.* ("Prevost") in view of "Octrees and their applications in image processing," *Proceedings of IEEE Southeastcon '90*, pp. 1116-1120 (April 1990) to Rambally *et al.* ("Rambally"). Applicants respectfully traverse the rejection.

As amended, independent claim 1 recites, among other features, "representing the voxel data by a tree structure of a predetermined depth in which

nodes include attached labels indicating their respective types, the types comprising nodes having sub-nodes, nodes having all voxels located in the background, nodes having all voxels located where objects exist, and nodes at the predetermined depth having voxels located where objects exist and in the background, wherein the nodes at the predetermined depth having voxels located where objects exist and in the background do not have sub-nodes."

Prevost describes an octree structure consisting of three types of nodes: nodes labeled "E" (for "empty") represent nodes that do not have properties and do not have children nodes, nodes labeled "P" (for "partial") represent nodes that have descendants, some of which have properties, and nodes labeled "F" (for "full") represent nodes having uniform properties but no descendants. (Prevost at col. 3, line 57 to col. 4, line 3). Thus, Prevost does not describe "nodes at the predetermined depth having voxels located where objects exist and in the background, wherein the nodes at the predetermined depth having voxels located where objects exist and in the background do not have sub-nodes," as recited in claim 1.

Similarly, Rambally describes an octree representation consisting of three types of nodes: terminal nodes labeled "BLACK" having entirely black voxels, terminal nodes labeled "WHITE" having entirely white voxels, and nonterminal nodes labeled "GRAY" having both black and white voxels. (Rambally at page 1116, "Object Representation"). Rambally teaches that the terminal nodes correspond to those cubes of the array for which no further subdivision is necessary, while the nonterminal (or GRAY) nodes necessitate further subdivision because they consist of both black and white voxels. (Rambally at page 1116, "Object Representation").

For example, Rambally shows an exemplary octree representation in FIG. 2(c) having terminal BLACK and WHITE nodes depicted by the black and white squares, respectively, and nonterminal GRAY nodes depicted by white circles. As shown in FIG. 2(c), the GRAY nodes are subdivided into sub-nodes. Thus, Rambally does not describe "nodes at the predetermined depth having voxels located where objects exist and in the background, wherein the nodes at the predetermined depth having voxels located where objects exist and in the background do not have sub-nodes," as recited in claim 1.

Therefore, for at least these reasons, Applicants submit that claim 1 is patentable over Prevost in view of Rambally. Accordingly, Applicants respectfully request that the rejection under §103(a) of claim 1, and of claims 6 and 30, which depend therefrom, be withdrawn.

For reasons analogous to those presented for claim 1, Applicants submit independent claim 24, as amended, is also patentable over Prevost and Rambally. At a minimum, no combination of Prevost and Rambally teaches or suggests "the node type information describes nodes having sub-nodes and nodes at a predetermined depth of a tree structure having voxels located where objects exist and in a background, wherein the nodes at the predetermined depth of the tree structure having voxels located where objects exist and in the background do not have sub-nodes," as recited in claim 24. Accordingly, Applicants respectfully request that the rejection under §103(a) of claim 24, and of claim 33, which depends therefrom, be withdrawn.

Further, for reasons analogous to those presented for claim 1, Applicants submit that independent claim 28, as amended, is also patentable over Prevost and

Rambally. At a minimum, no combination of Prevost and Rambally teaches or suggests “the node type information describes nodes having sub-nodes and nodes at a predetermined depth of a tree structure having voxels located where objects exist and in a background, wherein the nodes at the predetermined depth of the tree structure having voxels located where objects exist and in the background do not have sub-nodes” as recited in claim 28. Accordingly, Applicants respectfully request that the rejection under §103(a) of claim 28 be withdrawn.

Claims 18, 21, 22 and 31

Claims 18, 21, 22 and 31 have been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Samet, as applied to claim 7. Applicants respectfully traverse the rejection.

For reasons analogous to those presented for claim 7, Applicants submit that independent claim 18, as amended, is also patentable over Samet. At a minimum, Samet does not teach or suggest “nodes at the predetermined depth having voxels located where objects exist and in the background, wherein the nodes at the predetermined depth having voxels located where objects exist and in the background do not have sub-nodes,” as recited in claim 18. Accordingly, Applicants respectfully request that the rejection under §103(a) of claim 18, and of claims 21 and 22, which depend therefrom, be withdrawn.

Similarly, Applicants submit that for reasons analogous to those presented for claim 7, claim 31, which depends therefrom, is also patentable over Samet. At a minimum, Samet does not teach or suggest “nodes at the predetermined depth having voxels located where objects exist and in the background, wherein the nodes

at the predetermined depth having voxels located where objects exist and in the background do not have sub-nodes," as recited in parent claim 7. Accordingly, Applicants respectfully request that the rejection under §103(a) of claim 31 be withdrawn.

Claim 8

Claim 8 has been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Samet, as applied to claim 7, and further in view of "Implementing the PPM data compression scheme," *IEEE Transactions on Communications*, pp. 1917-1921 (Nov. 1990) to Moffat ("Moffat"). Applicants respectfully traverse the rejection.

For reasons analogous to those presented for claim 7, Applicants submit that claim 8, which depends therefrom, is patentable over Samet and that Moffat does not supply, and is not purported to supply, the teachings missing from Samet. At a minimum, no combination of Samet and Moffat teaches or suggests "nodes at the predetermined depth having voxels located where objects exist and in the background, wherein the nodes at the predetermined depth having voxels located where objects exist and in the background do not have sub-nodes," as recited in parent claim 7.

Thus, for at least these reasons, claim 8 is patentable over Samet in view of Moffat. Accordingly, Applicants respectfully request that the rejection under §103(a) of claim 8 be withdrawn.

Claim 5

Claim 5 has been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Prevost in view of Rambally, as applied to claim 1, and further in view of Samet. Applicants respectfully traverse the rejection.

For reasons analogous to those presented for claim 1, Applicants submit that claim 5, which depends from claim 1, is patentable over Prevost and Rambally and that Samet does not supply the teachings missing from Prevost and Rambally. For reasons already described herein, the internal/non-leaf nodes labeled GRAY in Samet do not describe "nodes at the predetermined depth having voxels located where objects exist and in the background, wherein the nodes at the predetermined depth having voxels located where objects exist and in the background do not have sub-nodes," as recited in parent claim 1.

Thus, for at least these reasons, claim 5 is patentable over Prevost in view of Rambally and further in view of Samet. Accordingly, Applicants respectfully request that the rejection under §103(a) of claim 5 be withdrawn.

Claims 3, 23, 25 and 32

Claims 3, 23, 25 and 32 have been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Prevost in view of Rambally, as applied to claims 1 and 24, and further in view of Samet and Moffat. Applicants respectfully traverse the rejection.

For reasons analogous to those presented for claim 1, Applicants submit that claim 3, which depends from claim 1, is patentable over Prevost and Rambally. Further, for reasons already described herein, Applicants submit that Samet does

not supply the teachings missing from Prevost and Rambally because the internal/non-leaf nodes labeled GRAY in Samet do not describe "nodes at the predetermined depth having voxels located where objects exist and in the background, wherein the nodes at the predetermined depth having voxels located where objects exist and in the background do not have sub-nodes," as recited in parent claim 1. Additionally, Applicants submit that Moffat does not supply, and is not purported to supply, the teachings missing from Prevost, Rambally, and Samet.

Thus, for at least these reasons, claim 3 is patentable over Prevost in view of Rambally and further in view of Samet and Moffat. Accordingly, Applicants respectfully request that the rejection under §103(a) of claim 3 be withdrawn.

For reasons analogous to those presented for claim 24, Applicants submit that claim 25, which depends from claim 24, is patentable over Prevost and Rambally. Further, for reasons already described herein, Applicants submit that Samet does not supply the teachings missing from Prevost and Rambally because the internal/non-leaf nodes labeled GRAY in Samet do not describe "the node type information describes nodes having sub-nodes and nodes at a predetermined depth of a tree structure having voxels located where objects exist and in a background," as recited in parent claim 24. Additionally, Applicants submit that Moffat does not supply, and is not purported to supply, the teachings missing from Prevost, Rambally, and Samet.

Thus, for at least these reasons, claim 25 is patentable over Prevost in view of Rambally and further in view of Samet and Moffat. Accordingly, Applicants respectfully request that the rejection under §103(a) of claim 25 be withdrawn.

Similarly, for reasons analogous to those presented for claim 24, Applicants submit that independent claim 23, as amended, is patentable over Prevost and Rambally. Further, for reasons already described herein, Applicants submit that Samet does not supply the teachings missing from Prevost and Rambally because the internal/non-leaf nodes labeled GRAY in Samet do not describe "decoding a 'P' node if the node type information indicates that the current node is a node at a predetermined depth of a tree structure having voxels located where objects exist and in a background and that the current node does not have sub-nodes," as recited in claim 23. Additionally, Applicants submit that Moffat does not supply, and is not purported to supply, the teachings missing from Prevost, Rambally, and Samet.

Thus, for at least these reasons, claim 23 is patentable over Prevost in view of Rambally and further in view of Samet and Moffat. Accordingly, Applicants respectfully request that the rejection under §103(a) of claim 23, and of claim 32, which depends therefrom, be withdrawn.

Conclusion

It is believed that this Response and Amendment requires no fee. However, if fees are required for any reason, please charge Deposit Account No. 02-4800 the necessary amount.

In the event that there are any questions concerning this paper, or the application in general, the Examiner is respectfully urged to telephone Applicants' undersigned representative so that prosecution of the application may be expedited.

Respectfully submitted,

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